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MINERALOGICAL REPORT ON A GOLD ORE FROM BRALORNE PIONEER MINES LTD., BRALORNE, B.C.

by

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EXTRACTION METALLURGY DIVISION

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SUMMARY

The rock comprising a gold ore sample from Bralorne Pioneer Mines Ltd. consists of a light coloured fine-grained groundmass of quartz, dolomite, and sericite cut by veins of quartz and dolomite. Fine-grained pyrite and arsenopyrite are disseminated through parts of the groundmass while coarser masses of stibnite occur in the veins. Although the ore contains 0.17 oz/ton of gold, none was observed microscopically. It is concluded therefore that the gold occurs in sub-microscopic form and is fairly evenly distributed throughout the rock with only minor concentration in pyrite.

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INTRODUCTION

In response to a request, dated April 6, 1960, from Mr. J.P. Weeks, chief geologist, Bralorne Pioneer Mines Ltd., Bralorne, B.C., the Mines Branch agreed to carry out metallurgical test work on a representative ore sample from the Company's Ace property in the Bridge River Valley, B.C. The sample received on December 16, 1960, consisted of approximately 500 lb of three-inch material and was given our reference No. 12/60-10.

In preparation for the metallurgical investigation a mineralogical study was made to determine the nature of the occurrence of the gold-bearing constituents, using selected hand specimens and also a representative -10 mesh head sample.

Assays on a head sample showed 0.17 oz gold and 0.095 oz silver per ton.

METHOD OF INVESTIGATION

The preliminary work in the mineralogical investigation of this gold ore was a study of the hand specimens at low magnification with a binocular microscope. A more detailed microscopic study was then carried out on eleven polished sections prepared from mineralized material selected from the hand specimens.

In an attempt to concentrate the gold-bearing constituents a gravity separation of a minus 150 plus 200 mesh size fraction of a head sample was carried out with a Haultain Superpanner producing a tip, middling, and tailing fraction. The superpanner tailing fraction was passed through a heavy liquid of specific gravity 2.96 to separate clean grains of non-opaque minerals from those containing minute inclusions of metallic minerals. Numerical counts of the mineral grains in polished sections of the tip, middling, and tailing-sink fractions were made, using a Swift Automatic Point Counter to determine the overall mineral composition. The tailing-float fraction was not point counted because of its very low metallic mineral content and the difficulty of distinguishing non-opaque minerals from the bakelite mounting medium of the sections. In calculating the overall mineral composition this fraction was assumed to consist entirely of non-opaque minerals.

In addition, semi-quantitative spectrographic analyses were run on each gravity fraction and on a sample of clean stibnite to determine whether the gold was concentrated in the metallic or non-opaque minerals and whether it was concentrated in one or more of the metallic minerals.

MINERALOGY

The sample is composed of a light coloured rock consisting of an intimate intergrowth of fine-grained quartz, dolomite, and sericite. This rock is penetrated by veins of white to smoky grey quartz and occasionally white to pale cream dolomite. The width of these veins varies from less than one millimetre up to as much as ten millimetres. Pyrite, stibnite, and arsenopyrite are the metallic minerals; the pyrite and arsenopyrite occur chiefly in the quartz-dolomite-sericite groundmass and the stibnite in the quartz veins. One dark green specimen consists of a fine-grained intergrowth of orthorhombic pyroxene (probably hypersthene) and quartz.

A summary of the overall mineral composition is given in Table 2.

The quartz-dolomite-sericite groundmass varies in colour from grey to cream to reddish-brown. The grey rock is most common and indicates a high quartz content while the cream coloured rock indicates a high dolomite content. The reddish-brown colour is uncommon. Blocks and lenses of the cream coloured groundmass frequently occur in the grey groundmass as well as occasional blocks and lenses of quartz and less often dolomite. Pieces of grey, cream, and reddish-brown groundmass are commonly present in the wider quartz veins particularly in the outer parts of the veins.

Pyrite, the most common metallic mineral, is disseminated in varying concentration in the quartz-dolomite-sericite groundmass (Figure 1) but only rarely occurs in the quartz veins. However, in some of the very fine quartz veins it is the major metallic mineral. In one specimen of the cream coloured groundmass pyrite is segregated into several narrow bands two or three millimetres wide. The grains of pyrite are usually sub-rounded or irregular and between 30 and 60 microns in size.

Arsenopyrite, too, is usually present in the quartz-dolomite-sericite groundmass rather than in the quartz veins (Figures 1 and 2). In polished sections the arsenopyrite occurs as rhombs, prisms, or fragments of these crystals and is finer than the pyrite. Some of the arsenopyrite crystals are segregated into dense masses up to 200 microns across (Figure 2). In many cases parts of these arsenopyrite aggregates are pale yellow giving them a mottled appearance (Figure 3). X-ray diffraction analysis of the mottled grains showed that they are intergrowths of pyrite and arsenopyrite.

Stibnite occurs as irregular masses up to several millimetres across in the quartz veins but rarely elsewhere (Figure 4). Arsenopyrite and occasionally pyrite are intergrown with the stibnite.

No gold-bearing mineral was observed in the microscopic investigation of eleven polished sections of chip specimens. Consequently, the gravity separation and semi-quantitative spectrographic analyses previously described under "Method of Investigation" were carried out in an attempt to concentrate the gold-bearing constituents. Table 1 gives the mineral composition of the gravity fractions in a sized sample while Table 3 shows the distribution of gold in the gravity fractions. The results indicate that the gold is fairly evenly distributed throughout the metallic and non-opaque minerals. Table 4, calculated to show the gold content of the individual metallic minerals, indicates a moderately increasing gold content from stibnite to arsenopyrite.

TABLE 1

Mineral Composition of Gravity Fractions

Minus 150 Plus 200 Mesh Size

Mineral	Weight %			
	Tip	Middling	Tailings-Sink	Tailings-Float
Quartz, dolomite, minor sericite and pyroxene	--	--	7.8	80.4
Pyrite	1.1	4.0	2.6	--
Stibnite	0.3	1.6	0.9	--
Arsenopyrite	0.2	0.7	0.4	--
Totals	1.6	6.3	11.7	80.4

TABLE 2

Summary of the Mineral Composition of the

Minus 150 Plus 200 Mesh Size

Mineral	Wt %
Quartz, dolomite, minor sericite and pyroxene	88
Pyrite	8
Stibnite	3
Arsenopyrite	1
Total	100

TABLE 3

Distribution of Gold in the Gravity Fractions

Minus 150 Plus 200 Mesh Size

Fraction	Wt %	Au Analysis %	Distn Au %
Tip	1.6	0.007*	1.9
Middlings	6.3	0.005*	5.3
Tailings-Sink	11.7	0.006*	11.8
Tailings-Float	80.4	0.006*	81.0
Totals	100.0	-----	100.0

*Semi-quantitative spectrographic analyses.

TABLE 4

Gold Content of Pyrite, Arsenopyrite, and Stibnite

	Pyrite	Arsenopyrite	Stibnite
% Gold	0.009*	0.006*	< 0.003**

*Calculated from semi-quantitative spectrographic analyses.
**Semi-quantitative spectrographic analysis.

Semi-quantitative spectrographic analyses are indicative only.

DISCUSSION AND CONCLUSIONS

An assay of the head sample showed 0.17 oz Au/ton in this ore. However, no gold-bearing mineral was observed in the investigation either in polished sections of chip specimens or in polished sections of a gravity concentrate. It is concluded therefore that the gold is in submicroscopic form.

Furthermore, it appears that while there is minor concentration of gold in the most abundant metallic mineral, pyrite, on the whole the gold must be fairly evenly distributed throughout the ore.

PHOTOMICROGRAPHS

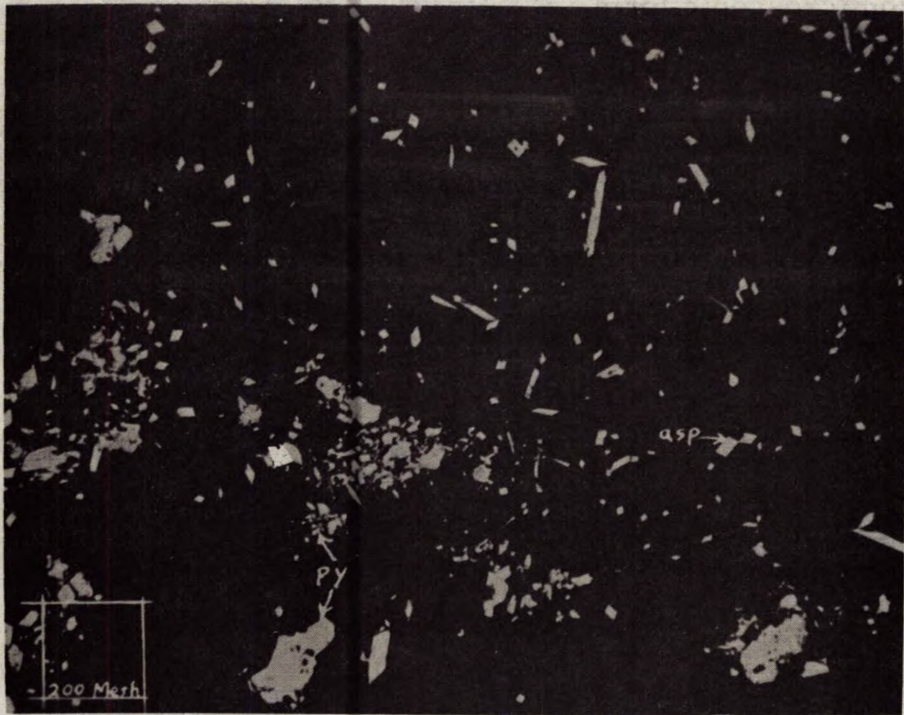

Figure 1. Disseminated pyrite (py) and arsenopyrite (asp) in quartz-dolomite-sericite groundmass. X110.

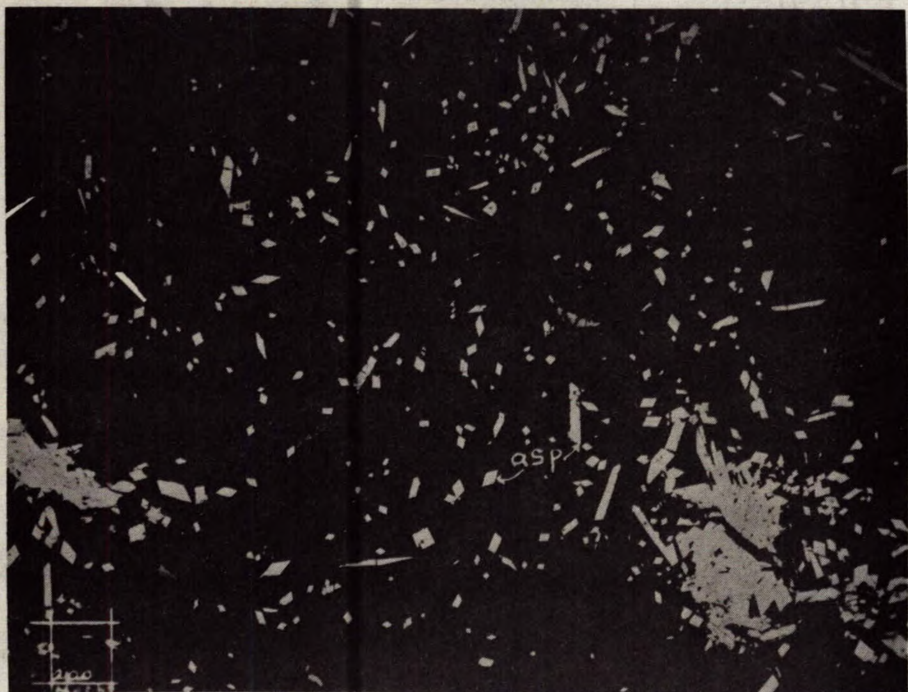

Figure 2. Arsenopyrite (asp), as disseminated grains and in aggregates. X180.

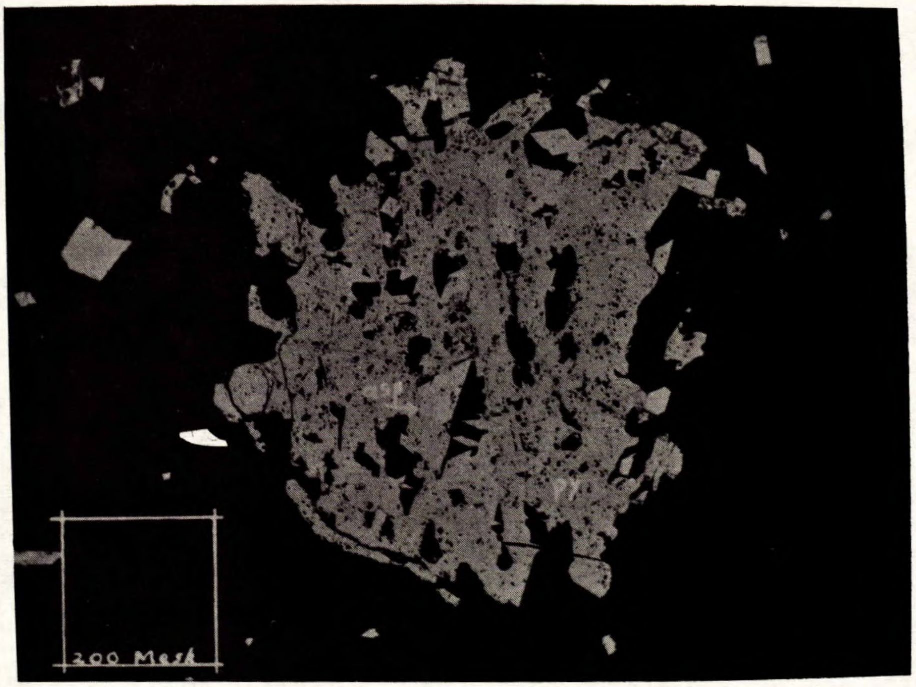

Figure 3. Mottled intergrowth of pyrite (py) and arsenopyrite (asp). X275.

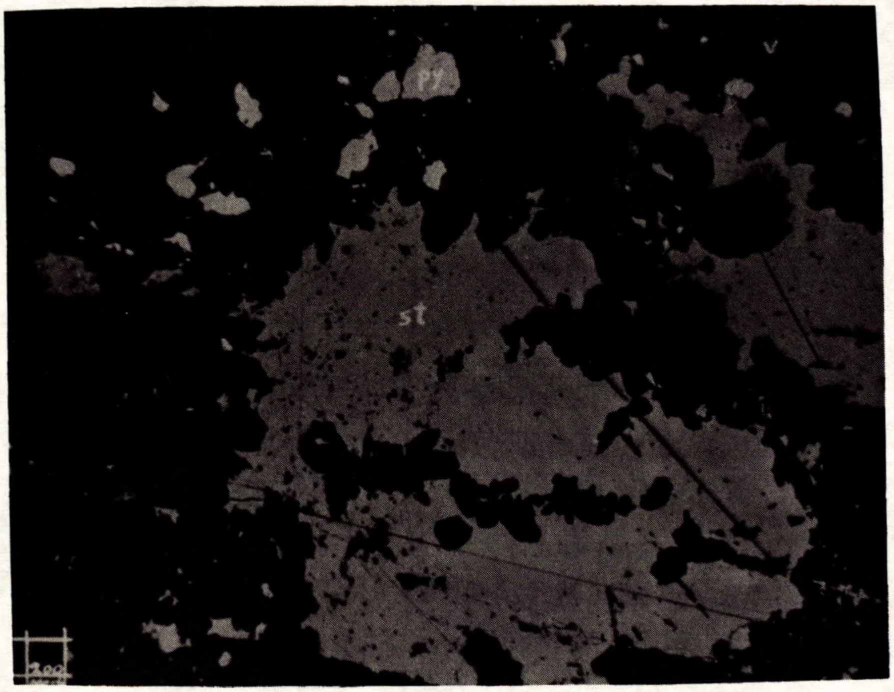

Figure 4. Irregular masses of stibnite (st) in a quartz vein. A few grains of pyrite (py) are also present. X65.